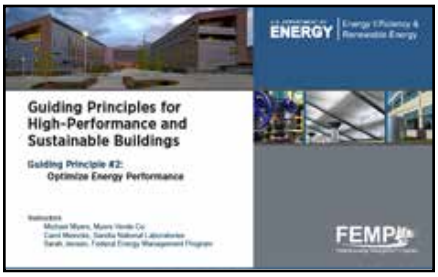
Guiding Principles for High-Performance and Sustainable Buildings eTraining Series

Course: FEMP 31
Duration: 1.0 hours
Learning Units: 1.0 LU
Prerequisites: None
HSW: Yes
IACET CEUs: 0.1

Guiding Principle II: Optimize Energy Performance



In the course, Guiding Principles for Existing High Performance and Sustainable Buildings, Guiding Principle II, Optimize Energy Performance, you will learn strategies for meeting the compliance requirements and recommended evidence of compliance for Guiding Principle II.

The Office of Management and Budget (OMB) uses the Guiding Principles to score federal agencies' progress and compliance within the Green Buildings category on annual agency scorecards.

This course focuses on the following fundamentals to meet and document compliance for high performance and sustainable buildings in a federal facility:

- Energy Efficiency,
- On Site Renewable Energy Generation,
- Measurement and Verification, and
- Benchmarking.

Instructor

The instructor for this course is **Sarah Jensen**, Technical Lead for Sustainability, Federal Energy Management Program. Sarah also co-chairs the Interagency Sustainability Working Group (ISWG) with GSA. She most recently served as deputy director and environmental counsel for the Green the Capitol Office for the U.S. House of Representatives. She received a bachelor's degree in mass communications from James Madison University and a juris doctor degree in energy, environment, and natural resources law from Northwestern School of Law at Lewis and Clark College.

Learning Objectives

By successfully completing this course, you will be able to:

- Identify and implement sustainable operations and maintenance practices in the areas of energy efficiency and environmental quality;
- Apply tools such as the EnergyStar Portfolio Manager to baseline and benchmark facilities, assess existing conditions, identify opportunities for improvement, and establish implementation plans and metrics to comply with the Guiding Principles;
- Recognize decision points and opportunities to implement sustainable strategies to achieve integrated, holistic and cost effective improvements; and
- Document meeting the Guiding Principle requirements through conformance with the recommended evidence of compliance.

In partnership with WBDG
WHOLE BUILDING DESIGN GUIDE
a program of the National Institute of Building Sciences

FEMP
Federal Energy Management Program

Guiding Principle II

2.1 Title Slide

Welcome to the FEMP e-Training series on Guiding Principles for Federal Leadership for Existing High Performance and Sustainable Buildings. This course is on Guiding Principle II, Optimize Energy Performance.

2.2 Navigation Instructions

Each page of this course contains a navigation bar across the bottom.
The course will not move to the next page automatically, so you will need to use these buttons to move within the course. Click the play button or pause button to play or pause the course.
Click the back button to review the previous page.
Click the forward button to go to the next page.
Click and drag the progress indicator to move the course forward or backward.
Click the audio button to turn the audio on or off.
Click the exit button to close the course window.
Click the arrows in the top left corner of the screen to open or close the table of contents.
Click the "Notes From the Field" icon for more information.
Click the magnifying glass icon for "Recommended Evidence of Compliance" information.

2.3 Guiding Principles Overview

Our course objective is to provide an overview of Guiding Principle II, Optimize Energy Performance for Existing High-Performance Sustainable Buildings. We will also discuss recommended evidence of compliance that corresponds with this guiding principle.

Federal agencies must comply with five Guiding Principles for High Performance and Sustainable Buildings.

1. Employ integrated assessment, operation, and management principles
2. Optimize energy performance
3. Protect and conserve water
4. Enhance indoor environmental quality
5. Reduce environmental impact of materials

Each guiding principle has its associated actions and requirements for compliance. In this course, we will cover Guiding Principle 2.

2.4 Guiding Principle II: Elements

Guiding Principle II has includes actions, requirements and Recommended Evidence of Compliance in the following areas:

Energy Efficiency
On Site Renewable Energy
Measurements and Verification, and
Benchmarking.

Now, let's get started.

2.5 Action: Energy Efficiency

The first action associated with Guiding Principle II is energy efficiency. This action has two requirements within it. The first requirement is to use one of three options to measure energy efficiency performance.

Option 1 is to receive an ENERGY STAR rating of 75 or higher, or an equivalent to a Labs 21 Benchmarking tool score for laboratory buildings.

Option 2 is to reduce measured building energy use by 20% compared to building energy use in 2003, or a year thereafter, with quality energy use data.

Option 3 is to reduce energy use by 20% compared to the ASHRAE 90.1 2007 baseline building design, if the design information is available.

The second requirement within this action is to use ENERGY STAR and FEMP Designated energy efficiency products.

Notes from the Field:
The Guiding Principles are applied on a building-by-building basis, and, when appropriate, location- or agency-specific policies can be used to meet the requirements. This first requirement under energy efficiency is building specific. The second requirement may use site or location policies as evidence of compliance.

Many agencies may have difficulties achieving the first requirement within the energy efficiency action. There are three options each agency can choose, and there are different factors that would go into choosing which option is best for a particular building.

2.6 Energy Efficiency: Option 1

The first option of the energy efficiency action in Guiding Principle II is to receive an ENERGY STAR rating of 75 or higher, or an equivalent Labs 21 Benchmarking tool score for laboratory buildings. Note that the Labs 21 benchmarking tool does not have an equivalent performance rating, so the ENERGY STAR rating is the means to achieve compliance within this action.

A building achieves an ENERGY STAR rating by using the EPA's Portfolio Manager to calculate an Energy Performance Score. Click on the icon to view Recommended Evidence of Compliance.

Recommended Evidence of Compliance: ENERGY STAR Statement of Energy Performance (SEP) shows a score of 75 or higher; ENERGY STAR Label; Guiding Principles Checklist in Portfolio Manager shows a score of 75 or higher.

2.7 Portfolio Manager

Portfolio Manager is a free, interactive management tool offered by the EPA. It allows users to track, assess, and benchmark energy and water consumption for all facility types across entire building portfolios. Portfolio Manager is important for certain "ratable" spaces, since it is a standardized metric for comparing whole building energy performance to other buildings of a similar type. Buildings that achieve an Energy Performance Score of 75 or greater in Portfolio Manager are eligible for an ENERGY STAR designation. Click on the link to access Portfolio Manager.
http://www.energystar.gov/buildings/index.cfm?c=evaluate_performance.bus_portfoliomanager

2.8 Spaces Eligible for an Energy Performance Score

Here are types of buildings eligible for an Energy Performance Score from Portfolio Manager. Office buildings, medical offices, warehouses, wastewater treatment plants, and data centers are all examples of federal facilities eligible to be rated within the rating types in Option 1. If an agency has a building or space that is not ratable, it is best to use Option 2 or Option 3 to achieve compliance. Portfolio Manager can be used to track and assess energy, greenhouse gas emissions, and water use for all facility types.

2.9 ENERGY STAR and Portfolio Manager – Required Data

You must collect required data to use Portfolio Manager to generate an Energy Performance Score. Information includes building identification - such as the building's name and street address – as well as data about the space type. This data includes square footage, hours of operation, number of workers on a main shift, number of personal computers, and percentage of the gross floor area that is air-conditioned or heated. Energy use information is very important in generating an Energy Performance Score. This information should include metered readings of energy consumption for a building for at least 11 consecutive months.

Click on the link to learn more about data requirements in the ENERGY STAR Data Collection Worksheet:
www.energystar.gov/ia/business/downloads/PM_Data_Collection_Worksheet.doc

2.10 Energy Performance Scale

This chart represents the Portfolio Manager's Energy Performance Scale; from 1 to 100. The number 1 indicates poor building performance on the Energy Performance Scale, while buildings that rate 75 or higher have achieved a good Energy Performance Score. If a building receives an Energy Performance Score of 75 or greater, it has achieved compliance for the first option.

2.11 Statement of Energy Performance

This is an example of a Statement of Energy Performance for an ENERGY STAR Labeled building. Portfolio Manager provides the option to print the Statement of Energy Performance, which may be used to document compliance.

As part of the application process, the applicant must have a Licensed Professional (LP) sign and seal their Statement of Energy Performance and sign the Data Checklist, validating that all of the submitted information is correct and that the indoor environmental quality meets industry standards.

2.12 Energy Performance Scores: Comparative Metric

Energy Performance Scores should be used to prioritize potential energy upgrades and improvements. This chart categorizes buildings with an Energy Performance Score between 1 and 49 as lower performing. These lower scoring buildings have the greatest potential for financial and environmental improvement.

Buildings with a rating between 50 and 74 are categorized as above average and may quickly achieve the ENERGY STAR label with low cost measures. Buildings with a score in this mid range are ideal candidates to move toward compliance with the Guiding Principle. Here, a small investment or change can boost that building's Energy Performance Score to 75 or greater.

Buildings with an Energy Performance Rating above 75 are top performers, and have already met compliance with the Guiding Principle. Remember, metered data is required to get an Energy Performance Score.

2.13 Example Building: Comparative Metric

This example building has received an Energy Performance Score of 62. This score is below the score of 75 that is necessary for an ENERGY STAR label, but it is still an above-average score. Minor energy saving improvements may be enough to boost the score up to 75. These improvements can include re-programming building controls, installing lighting occupancy sensors, using smart strips, and reaching out to the building's occupants to find methods to save energy.

Under FEMP's Energy Savings Performance Contracts, FEMP has developed a program called ENABLE. ENABLE is a type of streamlined ESPC process to quickly fund lighting, water, HVAC controls, simple HVAC system replacement, and solar PV in federal buildings less than 200,000 square feet.

Click the link to learn more about ENABLE. *http://energy.gov/eere/femp/espc-enable*

2.14 Energy Independence and Security Act of 2007 (EISA) – Section 435

Achieving an Energy Performance Score of 75 in Option 1 is imperative. Once a building achieves an Energy Performance Score of 75, it is then important to meet the other requirements for the Guiding Principles as soon as possible.

This reason why is because the Energy Performance Score must be current when the Guiding Principles are being approved. Some buildings, such as leased buildings, already have requirements for meeting the ENERGY STAR label.

As discussed previously, it is easier to exclude leased buildings from the 15% required by the Guiding Principles. However, some agencies will have no other option than to include leased buildings in its 15%. Section 435 of the Energy Independence and Security Act of 2007 (EISA) prohibits federal agencies, after December 19, 2010, from leasing buildings that have not earned an ENERGY STAR label. There are exemptions from Section 435. These exemptions include:

- If there is no space available in a labeled building that meets the functional requirements of an agency, which includes location needs;
- The agency proposes to remain in a building that it has occupied previously;
- The agency proposes to lease a building with historical, architectural, or cultural significance, as defined in Title 40 USC., or
- The lease is for a gross space of no more than 10,000 sq. ft.

2.15 Energy Efficiency – Baselines and Metering

Guiding Principle II Option 2 is to reduce measured building energy use by 20% as compared to building energy use in 2003, or a selected year thereafter that is measured quality energy use data.

Many agencies will select This option for their existing buildings since this option is easier to achieve, especially for older buildings. Once again, Option 2 dictates that energy use must be 20% less than measured values in 2003 or a year thereafter. Language can be interpreted in different ways.

- If a building did not have a meter installed until 2006, the data from 2006 would become the baseline. Or, perhaps
- If a building's overall use changes, and energy consumption increased dramatically after 2003 – in this case it is not it would not be feasible to compare 2003 energy use with current energy use.

Within Option 2, it is possible to choose a more relevant baseline year to accommodate these changes. The key is to remain consistent with the baseline use, especially in future years, in order to maintain data integrity.

Something to keep in mind In order to satisfy Option 2, is that reported reductions must be current. Documenting a 20% reduction in energy use between 2003 and 2009 is not current if the agency is reporting this value in 2013.

The reduction must take place between the established baseline year and the year the agency reports having met the Guiding Principle. A building can still be used to meet this guiding principle even if it is not metered. However, in this case timing becomes more important. It is recommended that An agency should install meters as soon as possible to measure at last one year's worth of data for a baseline.

It is also recommended that an agency should install meters before any energy improvements to a building take place to allow for tangible evidence of reduction in energy use after the meters are installed. Click on the icon for the Recommended Evidence of Compliance.

> **Recommended Evidence of Compliance:** ***Sustainable Buildings Checklist*** in Portfolio Manager shows a "Change from Baseline" of 20% or documented energy usage that shows a reduction of 20% or more.

2.16 Action: Energy Efficiency – Quality Data

Option 2 of the energy efficiency action for Guiding Principle II may sound similar to other federal requirements, or agency specific goals that are in place. But it focuses heavily on energy consumption, rather than energy intensity.

While some agency data may fulfill another federal or agency-specific requirement about energy intensity, the same data may not satisfy the information needed for Option 2. This option does not take into account changes in building function, use, or occupancy from 2003 to the present. This may affect an agency's decision about whether or not to use this option for a candidate building.

To satisfy the "quality energy use data" requirement for Option 2, it is strongly recommended that the agency use metered data. However, there are methods an agency can use to track improvements or investments in a building that have decreased its overall energy consumption without metered data. Such things as calculated energy use and energy data, data loggers, and other methods can be used to prove a 20% reduction in energy use in the building without having metered data.

Many sites track their energy use directly, or they are paying for energy and therefore have energy bills from an outside party, and can demonstrate a 20% energy reduction through these means. As long as the methods are defensible, an agency can employ a variety of means to demonstrate the 20% reduction in energy consumption for a building.

2.17 Action: Energy Efficiency – Option 3

Option 3 is to reduce energy use by 20% compared to the ASHRAE 90.1 2007 baseline building design, if the design information is available. This option utilizes modeling methodology to prove reduction of energy use in a building. For most existing, older buildings, especially those that are older, this option is not feasible, because this method compares buildings against the ASHRAE 2007 standard.

If a building was constructed in 1990, it will be difficult to quantify a reduction in energy use using the ASHRAE 2007 standards. However, if a building has undergone significant remodeling, or if energy saving measures were installed, the ASHRAE 90.1 2007 standards may apply, even for older buildings. Overall, however, Option 3 is not practical for many agencies with older buildings. Click on the icon for the Recommended Evidence of Compliance.

Recommended Evidence of Compliance: Results from computer program analysis that highlights 20% or better energy savings.

Click on the link to learn more about DOE's energy analysis software.
http://apps1.eere.energy.gov/buildings/energyplus/

2.18 Action: Requirement 2

The second requirement under energy efficiency is to use ENERGY STAR and FEMP designated energy efficiency products where available. When the Guiding Principles were designed in 2006, there were fewer ENERGY STAR and FEMP designated products.

Currently, there are many more choices and products that fulfill this requirement. As such, it is more difficult to prove that these products are not available or not feasible for use. Click on the link to view a list of these products.
http://www1.eere.energy.gov/femp/technologies/eep_purchasingspecs.html

Click on the icon for the Recommended Evidence of Compliance.

Recommended Evidence of Compliance:
- Contracts or policies for the purchase of ENERGY STAR- and FEMP-designated products
- Agency, site-level, or building-level purchasing policy includes ENERGY STAR- and FEMP-designated products
- Requisition data and purchase orders confirming
- ENERGY STAR- and/or FEMP-designated products
- Building level affirmative procurement plan

2.19 Requirement 2 – Sample Language

Agency procurement officials should ensure that contracts include language that specifies energy efficient products and services. Professional organizations provide specifications to clarify the selection of energy efficient products and services. For example: Construction Specifications Institute, American Institute of Architects' Master Spec, and others are good sources of information on how an agency can specify these types of products.

Click on the graphic to learn more about the sample language that could be used to meet the second requirement of the energy efficiency action.

Sample Language: The Contractor shall ensure that energy-consuming products are energy-efficient products (i.e., ENERGY STAR products or FEMP-designated products) at the time of contract award, for products that are:

(1) Delivered;
(2) Acquired by the Contractor for use in performing services at a federally controlled facility;
(3) Furnished by the Contractor for use by the Government; or
(4) Specified in the design of a building or work, or incorporated during its construction, renovation, or maintenance.
(c) The requirements apply to the Contractor (including any subcontractor) unless—
(1) The energy-consuming product is not listed in the ENERGY STAR program or FEMP; or
(2) Otherwise approved in writing by the Contracting Officer.

Click on the link for more information about energy efficient product procurement.
http://energy.gov/eere/femp/energy-efficient-product-procurement

2.20 Action: On-Site Renewable Energy

The second required action for Guiding Principle #2 is the generation of on-site renewable energy. This action dictates that an agency "implement renewable energy generation projects on agency property for agency use, when lifecycle cost effective."

At locations where renewable energy is not cost effective, a report or statement to that effect is required to comply with this action. Renewable energy projects must be located on site to achieve compliance, and renewable energy certificates cannot be used. Many agencies may already have policies in place that overlap with this requirement.

This action can be met in several ways, including site-wide installation on agency property or building specific

installation. For example, one renewable energy installation alone can cover all the buildings at that site. There is no minimum size or energy generation requirement listed under this action for this Guiding Principle.
Click on the icon for Recommended Evidence of Compliance.

Recommended Evidence of Compliance: Documentation, analysis, photos of existing RE generation projects OR document justification that RE system is not life-cycle cost effective.

Notes From the Field:
According to Executive Order 13514, renewable energy is defined as energy produced by solar, wind, biomass, landfill gas, ocean – which includes tidal wave, current, and thermal – geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency, or additions of new capacity in an existing hydroelectric project.

2.21 Guiding Principle II: Measurement and Verification

The next action within Guiding Principle II is Measurement and Verification. This action states that - per the Energy Policy Act of 2005 (EPACT) Section 103 - the agency must install building level electricity meters to track and continuously optimize performance. The utility meters must also include natural gas and steam, where these are used.

This action overlaps other federal requirements, two of which are mentioned in Guiding Principle II, and may also overlap other agency-specific goals. Many agencies already have metering goals and require specific documentation that would overlap this requirement, or may even overreach this requirement.

This Guiding Principle covers all energy streams, not just electricity. Monitor and meter all sources of energy for a building. Click on the graphic to read the exact wording of the metering requirement.

42 U.S.C. § 8253(e). Metering of energy use -
"By October 1, 2012, in accordance with guidelines established by the Secretary under paragraph (2), all federal buildings shall, for the purposes of efficient use of energy and reduction in the cost of electricity used in such buildings, be metered. Each agency shall use, to the maximum extent practicable, advanced meters or advanced metering devices that provide data at least daily and that measure at least hourly consumption of electricity in the federal buildings of the agency. Not later than October 1, 2016, each agency shall provide for equivalent metering of natural gas and steam, in accordance with guidelines established by the Secretary under paragraph (2). Such data shall be incorporated into existing federal energy tracking systems and made available to federal facility managers."

Click on the icon for Recommended Evidence of Compliance.

Recommended Evidence of Compliance:
Document on-site meters or utility metered accounts; Metering plan with list of meters

2.22 Guiding Principle II: Action: Benchmarking

The fourth, and final, action towards achieving Guiding Principle II is benchmarking. This action requires comparing annual performance data with previous years' performance data, preferably by entering annual performance data into the ENERGY STAR Portfolio Manager or Labs21 for laboratories. If Portfolio Manager is used to generate an annual performance score, the benchmarking requirement has been met.

As stated earlier, some buildings are not ratable under Portfolio Manager. If this is the case, the agency must provide documentation comparing annual performance data. This may be a compilation of data from previous years, or a comparison of the building's data against other buildings that provide the same function. Click on the link to learn more about Labs21 benchmarking tools.
http://labs21benchmarking.lbl.gov/

Click on the icon for Recommended Evidence of Compliance.

Recommended Evidence of Compliance:
- Current PM Benchmark Performance Report
- PM Baseline Comparison report for the two most recent comparative periods
- Current PM Statement of Energy Performance

- Labs21 Benchmark Report
- Other documentation showing comparison between the two most recent periods

2.23 Federal HPSB Checklist – Roles, Responsibilities, Documentation

In preparing to meet Guiding Principle II, agencies should establish team member roles and responsibilities, and an archiving process. Agencies should also identify and establish internal procedures to collect and document compliance to ensure accuracy, reliability, and performance. Team collaboration is very important!

2.24 Guiding Principle II: Course Summary

This course covered Guiding Principle II, Optimize Energy Performance. We covered:

- Energy Efficiency
- On Site Renewable Energy
- Measurements and Verification, and
- Benchmarking.

Thank you for your interest and commitment for Federal Leadership in Sustainable High Performance Buildings. We hope that you will also take the other e-Trainings in this series on the Guiding Principles.

Now, please take a moment to click on the link at the top of your screen to complete the quiz and short course evaluation. This will provide you with continuing education credits and provide FEMP with valuable feedback to continue to improve training offerings.

End of Guiding Principle II Course